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ABSTRACT

Act Number 307, Public Acts of Michigan 1969, mandates that the Department of Education provide annual assessment of pupil achievement in basic skills -- reading, vocabulary, English expression and mathematics. The purpose of the assessment program is to provide information about groups of children for decision makers at the state level. A rationale for variable selection, the statistical methodology employed, and the procedural limitations are presented. The rationale emphasizes the strong relationship of pupil background (socioeconomic status, attitudes and aspirations) and school resource variables (human and financial) to each other and to student performance. The methodology emphasizes simple and easily comprehensible reporting, but includes multivariate analysis of the data; and program's limits include problems of defining and measuring the complexities of an educational system. Measures of all variables were obtained in January 1970 for 310,000 pupils in grades four and seven. Analyses are in progress. (Author/ES)

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PROVIDING INFORMATION FOR DECISION-MAKERS IN MICHIGAN: COMPILATION, ANALYSES AND REPORTING OF ASSESSMENT DATA

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> The Department of Education shall provide for an annual test or tests of pupil achievements in the basic skills. Such test or tests shall provide for the objective measurement of pupil learning outcomes in reading, mathematics, language arts and/or other general subject areas. Such test or tests shall be undertaken at one or more grade levels among elementary and/or secondary school pupils and shall be made statewide in application insofar as is necessary and possible.[1]

When this piece of legislation was enacted and became law on August 12, 1969, the Michigan Department of Education, Bureau of Research, hastily moved into action to implement this mandate so that a report could be assembled by June 15, 1970. Obvious questions are immediately evident: What grade or grade levels should we assess? Should we sample students or items or both students and items? Should we measure the population? What variables should we attempt to index? Should we attempt the project in-house or contract with a testing firm? Are methodologies available and accessible to index the desired variables? Closure on these and similar issues was of top priority and closure came quickly.

The Bureau staff after receiving positive feedback from the State Superintendent of Public Instruction and prior to introducing the program to the legislature devised several contingency plans ranging in magnitude from testing every child at three or four grade levels with a full length battery down to abolishing all plans for the program's implementation. Realizing the possible magnitude of the program, contact with five large testing firms was initiated for the purpose of securing information relative to the building and scoring of our desired test instrument. The testing firms immediately submitted information concerning their possibilities

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[1] Section 14 of Act No. 307 Public Acts of Michigan 1969.

and capabilities with respect to the several phases of our contingency plan. The legislature upon recommendations from the Bureau then authorized the spending of funds so that testing could be done at two grade levels with a shortened version of a full length test battery. The shortened test battery had the obvious advantages of financial savings and shortened testing time of pupils. As implied in the original act, each public school child was to be required to respond to the basic skills battery. Shortly after the authorization of funds, the Bureau enlisted the aid of Educational Testing Service to assist in developing and implementing the Basic Skills Program.

The decision concerning which two grade levels to assess was made by the bureau staff. The fundamental consideration was that measures should be obtained at specific points in time in the students' academic progress. The consensus was that, ideally, one would like to have a measure of the child before he starts the educational process, probably preschool. This would be followed by a measure after the child's primary education of about grade three or four. This would be followed by a measure of post elementary school or grade six or seven. This would be followed by a measure of post junior high school or grade nine or ten. Finally, some measure would be taken of the total educational process or grade twelve. Methodological problems of unreliability quickly ruled out the preschool measure and dropout students complicated the grade twelve measure. Of the remaining grade levels, grades four and seven were selected as the areas of concentration. Because of the wording of the public act, a more precise definition of basic skills was also required. Through research at the Bureau and in conjunction with Educational Testing Service, basic skills were defined

to be reading, English expression, vocabulary, and mathematics.

The basic purpose of the assessment program is to provide information for decision-makers at the state level. These decision-makers are concerned with groups of children rather than individual children. Therefore it was possible to adopt a shortened version of a full length test battery, since this would yield reliable and stable estimates of group parameters and be quicker and less expensive than the full measure. It would also not eliminate the need for testing programs at the local level. The savings in time and expense and consideration of local autonomy were all key political factors.

Previous Research

As previously stated, basic skills is not the only area of interest. The correlates of education were also considered to be very important. The work of Mort[1], Flanagan[2], Benson[3], Burkhead, Fox and Holland[4], Coleman[5] and many others all indicate that there are prime considerations in education over and above the typical output measures. These variables must be considered when one attempts to measure and interpret school performance. To look only at outputs of the system without regard for the inputs and

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[1]Paul R. Mort, "Studies in Educational Innovation from the Institute of Administrative Research: An Overview," IAR Research Bulletin, III (Oct. 1962).

[2]John C. Flanagan and others, A Survey and Follow-up of Educational Plans and Decisions in Relation to Aptitude Patterns: Studies of the American High School (Pittsburgh: University of Pittsburgh, 1962).

[3]Charles I. Benson, State and Local Fiscal Relationships in Public Education in California (Sacramento: Senate of the State of California, 1965).

[4]Jesse Burkhead, Thomas G. Fox, and John W. Holland, Input and Output in Large-City High Schools (Syracuse: Syracuse University Press, 1967).

[5]James T. Coleman and others, Equality of Educational Opportunity (Washington, D. C.: U.S. Government Printing Office, 1966).

process of the system is meaningless. Therefore, the bureau staff, guided by the previous literature and in consultation with Educational Testing Service, set out to index what they considered to be variables that are relevant and related to the educational system. After extensive review of the literature, numerous consultations with noted academic scholars and numerous bureau meetings, four areas were delineated as being highly related to academic achievement. These areas are socioeconomic status, the attitudes and aspirations of the students within a building, and the resources any given school can bring to bear upon its students. These school resources are considered to be both human and financial. Obviously there are other possibilities that merit consideration, but for the purposes of the first year of the program, these measures were chosen.

Defining the Variables

Exactly how do we define socioeconomic status, attitudes and aspirations, school human resources and school financial resources? Realizing that we do not have a universally accepted definition of socioeconomic status and attitudes and aspirations or a rigorous method for indexing them, several arbitrary decisions were made. The socioeconomic status and attitudes and aspirations variables are defined in terms of the individual child's response to the first section of the assessment battery. The first section of the battery is comprised of twenty-six items, thirteen of which attempt to index the child's attitudes and aspirations and twelve of which attempt to index socioeconomic status. These items are analogous to the items Coleman used in his study, Equality of Educational Opportunity and are indirect measures of the child's psychological self perceptions and home environment. An example of a socioeconomic status item might be, "Does your family have a dishwashing machine?" And an example of an attitude item might be, "If you

could change would you be someone different?" There were three viable choices of sources for obtaining socioeconomic status and attitude and aspiration data on a building level and these were the child, the teacher and the principal. In anticipation of a lack of reliable and valid data elicited from either school principals or teachers, the child was chosen as the source of this information. The school human and financial resource data are being collected from state records. This method of securing data has the advantage of time and cost savings. Unfortunately, however, this data is only available in district aggregate form. There is no possibility of getting these data for each building. Thus this aspect of the program must be considered less than rigorous methodologically and falls prey to some of the criticism leveled at the Coleman data, i.e., some of the greatest discrepancies between building resources is within districts rather than between districts. The primary variables under consideration for school human resources by district are average teacher salary, percentage of teachers with masters degrees or above, the average years of teaching experience per teacher, and the total pupil per professional personnel ratio. The variables under consideration for school financial resources by district are local revenue per pupil, state school aid per pupil, elementary-secondary instructional expense per pupil, total current operating expenditure per pupil and state equalized valuation per pupil. It is realized that this listing is neither exhaustive nor indicative of all relevant school resources. However, considering the relevant literature on this subject in conjunction with the kinds of information that are available at the state level the selected variables all appear to be reasonable. Planning is currently underway so that individual building data on school human and financial resources will be available in future years.

The indexing of the basic skills variables required a set of test specifications for each skill area. These specifications were then reviewed and modified by teachers, administrators, curriculum consultants and bureau staff with respect to commonly used text books, teaching practices and recent literature in the State of Michigan. This reviewing procedure considered both relevancy and emphasis on material. Educational Testing Service then built the assessment battery according to these specifications. A proto-type of the final test battery was also subject to review and modification.

Administration of the Battery

During the last two weeks of January, 1970, approximately 310,000 students in the public schools of Michigan were given the Basic Skills Assessment Battery. This massive effort would have been impossible without the cooperation of the local education agencies. A request to the local district superintendent by the Bureau of Research asked the superintendent to designate someone in his district to coordinate the testing program within the schools in the specific district. The support, cooperation and coordination that was evidenced at this and, even more surprisingly, at the teacher level was overwhelmingly positive. This enthusiasm was much greater than we had anticipated and lends credence to the validity of the data. However, there may be data missing from individual buildings and entire districts. The socioeconomic status and attitude and aspirations items became highly contested issues in certain communities with the outcome being that certain principals or district superintendents eliminated these items from the assessment battery. What effect this missing data will have upon the ultimate results remains to be seen. Missing data from individual students will be taken into account during the consolidation and compilation of

building and district scores.

Analyzing and Reporting the Data

In any meaningful study, the analysis of the data must be guided by the purpose of and the specific questions asked by the study. A brief review of the basic questions may be beneficial at this time. The questions are: (1) What is the level of educational performance and its correlates in (a) Michigan and (b) in Michigan's geographic regions and community types? (2) Do districts (or schools) that score high (or low or average) on performance measures also score high (or low or average) on the correlates of education in (a) Michigan and (b) within Michigan's geographic regions and community types? (3) What are the scores of each of Michigan's districts on educational performance and its correlates? (4) Do districts (or schools) that score high (or low or average) on socioeconomic status measures also score high (or low or average) on achievement and the correlates of education in (a) Michigan and (b) within Michigan's geographic regions and community types? (5) What is the present level of educational performance and its correlates within the State's large school district? (6) What changes over time may be noted in the answers to the above questions?

All but the last of these questions, (i.e., what changes over time may be noted), can be addressed with the data from the 1969-70 assessment program. To answer the five basic questions a separate analysis will be conducted at each grade level. This analysis will attempt to relate the correlates of education to the outcomes of education in several specific ways. First the socioeconomic status and attitude and aspiration items will be factor analyzed to attempt to reduce these variables to a workable number. Then the socioeconomic status, attitude and aspirations and basic skills variables for each student will be converted to standard scores. The zero order

correlation between all variables will be obtained. Because a shortened version of a full length test battery was adopted, the reliability of the full length battery is necessarily reduced and because of this increase in unreliability, individual results will not be reported. The unreliability also has a tendency to underestimate the relationships between the variables. Item analyses and reliability measures will be provided for the state as a whole and selected sub-population.

Using the standard score for each pupil on each variable, two separate units of analysis will be obtained. One unit of analysis will be the school building score built by a composite of the students' standard scores within the building and the other unit of analysis will be the school district score built by a composite of the students' standard scores within the district. The district variables will be augmented by the school human and financial resources variables; these variables are not available at the building level. There will be a separate analysis for each grade level. There are approximately 3800 school buildings and 634 school districts in the State of Michigan.

The state was divided up on the basis of geography and community type and this led to four defined geographic regions, five defined community types, and the combinations of community type and geographic region.

Definitions of Michigan's Community Types and Geographic Regions

Community Types

I Metropolitan Core = One or more adjacent cities with a population of 50,000 or more which serves as the economic focal point of their environs.

II Cities = Communities of 10,000 to 50,000 population that serves as the economic focal point of its environs.

III Towns = Community of 2,500 to 10,000 population that serves as the economic focal point of its environs.

IV Urban Fringe = A community of any population size that has as its economic focal point a metropolitan core or a city.

V Rural Community = A community of less than 2,500 population

TABLE I

REGIONS

COMMUNITY TYPES

	I DETROIT METRO.	II SOUTHERN MICH.	III NORTHERN LOWER MICH.	IV UPPER PENINSULA
I METRO. CORE				
II CITIES				
III TOWNS				
IV URBAN FRINGE				
V RURAL				

Geographic Regions

I Detroit Metropolitan Area = This consists of Wayne, Oakland and Macomb counties.

II Southern Michigan (excluding the Detroit Area) = All counties in southern Michigan that are south of and include Muskegon, Kent, Montcalm, Gratiot, Midland and Bay counties

III Northern half of lower Peninsula = All counties that are north of region II and that are in the lower peninsula

IV Upper Peninsula = This consists of all counties in the Upper Peninsula

There is a slight methodological problem in the matrix of community type and geographic region--there are four empty cells (See Table I). For example, there are no metropolitan core cities in the upper peninsula of Michigan. Thus, certain statistical analyses are automatically eliminated on this aspect of these data. These regional and community type breakdowns will augment the analysis of the state as a whole and also allow for the comparisons of regions, community types, and the combinations of regions and community types with respect to the variables under consideration.

There are many sophisticated analyses which could be undertaken, but these analyses are not readily interpretable or understandable to legislators, state and local school officials, teachers and the lay public. Therefore, the initial analyses and reporting will be done to facilitate interpretation and understanding of the results at the level of the layman. This will be accomplished through several efforts at two distinct levels. These two levels are a public and a private reporting system. The private report will provide each local district superintendent with a score for each variable for his district and for each school building within his district. This report will speak to question number three. The public report will eliminate the names of buildings and districts and use these data to present additional infor-

mation. These building and district scores in isolation are relatively meaningless. Therefore, norm tables for the state as a whole, the four geographic regions, the five community types and the sixteen combinations of regions and community types will be constructed showing the sample size, mean, standard deviation and the distribution of percentiles and frequencies for each variable. This will be done with each unit of analysis at each grade level resulting in a total of 104 norm tables. For example, the norm table for grade 4 for the combination of Region I and Community Types II, using building scores as the units of analysis, may have 50 buildings on which to construct the norm table. This single norm table will contain a separate mean, standard deviation, sample size, percentile distribution and frequency distribution for each variable under consideration. The variables under consideration are socioeconomic status, attitudes and aspirations, reading, vocabulary, English expression and mathematics. It quickly becomes apparent that relatively few of the norm tables are appropriate for any given building. This will allow each district and building in the state to determine its relative status on each considered variable taking into account several independent variables, i.e., community type, geographic region and grade level. These reports will speak to question number one.

In addition to these considerations, the socioeconomic status score will be broken into three categories, high,middle and low socioeconomic status, and will be used as a blocking variable to consider the relationships with the remaining correlates of education and the dependent variables, i.e., basic skills. This will be done for the state as a whole using both building and district scores as the units of analysis. Each of the geographic region and community type breakdowns will use a socioeconomic status cutoff scores for the high, middle and low socioeconomic status categories

that are based upon only the buildings (or districts) that are contained within the specific region or community type. Thus, a region which is relatively affluent may have many buildings in the high socioeconomic status category for the state as a whole, but will have an equal number of buildings in the high, middle, or low socioeconomic status groups on the regional breakdown. It is, therefore, possible for a school to be classified in the high socioeconomic status category for the state as a whole and at the same time be classified in the middle or low socioeconomic status category on a regional or community type classification. This conveys relevant and meaningful information if the mean and standard deviation in each category are reported. An additional consideration is that when one aggregates data at the district level according to the suggested breakdowns, the information contained in the data may be distorted, masked or both distorted and masked because of the wide discrepancies within districts. These reports speak to question number four.

A third phase of the public reporting will be to obtain a total achievement score (the sum of the four basic skill standard scores) for each building and each district. Once again there will be two separate units of analysis resulting in two separate reports. The total achievement score will be broken down into high, average and low achievement categories to be used as a blocking variable against the remaining variables. Categorization on region, community type and the combination of region and community type will be analogous to the format specified in the socioeconomic status categorization. For example, the cut off scores used for categorization of the total achievement score will change from region to region and community type to community type. These reports will speak to question number two.

Using the results of the data analysis, four of the five specific questions can be answered, i.e., the status and distribution of basic skills education and their correlates in Michigan will be documented. Thus, the legislators will have an objective, methodologically rigorous body of information available to them upon which to base vitally important decisions concerning education. These analyses present descriptions of the relative status and distribution of the relevant variables and the relationships therein; these descriptions will be of the state as a whole, the four geographic regions, the five community types and the sixteen combinations of region and community type for both the fourth and seventh grades.

Because of temporal constraints, these primary analyses must be submitted to the legislature by mid-June; our target date is June 1, 1970. However, this does not eliminate the possibility and probability of additional analysis. A multivariate analysis of variance will be employed using the categorized input variables as the independent variables and the basic skills variables as the dependent variables. Two separate multivariate analyses will be conducted; one analysis will use the school building as the unit of analysis and the other will use the school district as the unit of analysis. Other second order analyses call for various contingency tables and sub-samples of the population. Of particular interest is a comparison between school districts covering grades Kindergarten through twelve as opposed to those which do not span the entire thirteen grades. Another planned analysis deals with a multiple regression model being utilized to predict achievement from several input factors. It is not difficult to envision a number of additional analyses that may be of interest and importance. Certainly the bureau staff will not be able to exhaust these many possibilities due to time and resource constraints. Competent

researchers outside the bureau may be interested in specific aspects of these data.

In closing I would like to emphasize the fact that assessment has had a tremendous impact on the state of Michigan. A large Michigan school district writes in its local assessment bulletin number seven:

> "In all three areas, state, school district and individual curriculum areas, assessment has forced us to take a new look at our goals. In this way the assessment program is proving valuable, even before we have any actual results from the assessment."[1]

The forth coming results are anxiously awaited and to say the least, Michigan legislators, state and local school officials, teachers and lay citizens are aware of the potential of the assessment program. With continued success, support and implementation of the assessment program, the ramifications and possible consequences for reforming the educational enterprise in Michigan are considerable.

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[1]Lansing School System, Assessment Bulletin Number 7, February, 1970, Lansing, Michigan.